MULTIMEDIA UNIVERSITY

STUDENT ID NO

SEAT NO

VENUE:_____

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID: 2210)

PMT0101 – MATHEMATICS I

(All sections/ Groups)

13 FEBRUARY 2023
2.30 p.m. – 4.30 p.m.
(2 Hours)

Question	Marks
1	/10
2	/10
3	/10
4	/10
5	/10
Total	/50

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **ELEVEN** printed pages excluding the cover page.
2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the **QUESTION BOOKLET**. All necessary working steps **MUST** be shown to obtain maximum marks.

Question 1

a) Simplify the expression $\frac{x}{x+1}+\frac{x-1}{2x}$ and leave your answer in a single quotient.

[1.5 marks]

b) Simplify the expression $\left(\frac{x^{-2}y}{2}\right)^2\left(\frac{\sqrt[3]{8x^3}}{y^{-1}}\right)$ and leave your answer in term of positive exponents.

[2 marks]

c) Rationalize the denominator for $\frac{1}{\sqrt[3]{x}}$ and simplify. [1 mark]

Continued...

d) Factorize the expression completely: $x^3-3x^2-4x+12$. [1.5 marks]

e) Express $\frac{1-2i}{2+3i}$ in the form $a+bi$ where a and b are real numbers. [2.5 marks]

f) Solve $\left(1+\sqrt{-4}\right)\left(3-\sqrt{-1}\right)$ and leave your answer in the form $a+bi$ where a and b are real numbers. [1.5 marks]

Continued...

Question 2

a) Find the complex solutions of the equation $3x^2 - 6x + 9 = 0$ using completing the square and express your final answer in the form of $a + bi$. [2 marks]

b) Solve the equation $\sqrt{2x+1} + 1 = x$. Check the correctness of your answer. [3 marks]

Continued...

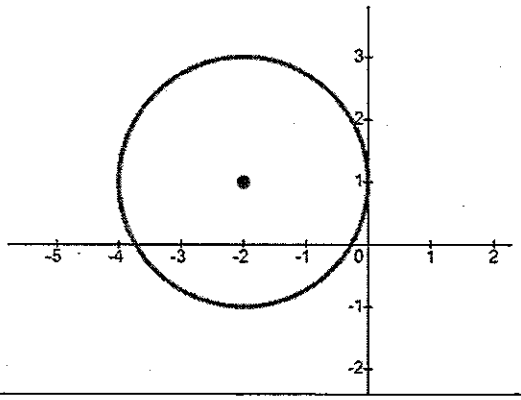
c) Solve the equation $|2+3x|-5=-1$. [2 marks]

d) Solve $(x+2)(x-3)<0$. Show clearly your Sign Diagram and give your final answer in interval notation. [3 marks]

Continued...

Question 3

a) Find the equation of the circle in the form $(x-h)^2+(y-k)^2=r^2$ where h, k and r are constants. [1 mark]



b) Given an equation of a circle $x^2+y^2-6x+4y-1=0$.

i) Express the circle equation in the form $(x-h)^2+(y-k)^2=r^2$ where h, k and r are constants. [2 marks]

ii) Find the center and radius of the circle. [1 mark]

Continued...

c) Find an equation of a line that contains the point $(2,-3)$ and is perpendicular to the line $2x-y-3=0$ Write your final answer in the form $y=mx+b$ where m is the slope and b is the y-intercept. [2 marks]

d) Given a point $P(x,y)$ moves such that its distance from point $Q(5,-3)$ is 2 units. Find an equation of the locus of P. [2 marks]

Continued...

e) Given $A(-2,1)$, what are the coordinates of $B(x,y)$ if $P(7,5)$ divides the line segment AB internally in the ratio $2:3$. [2 marks]

Question 4

a) Given $f(x)=2x-3$ and $g(x)=\sqrt{3x-5}$.

i) Find $(g \circ f)(x)$. [2 marks]

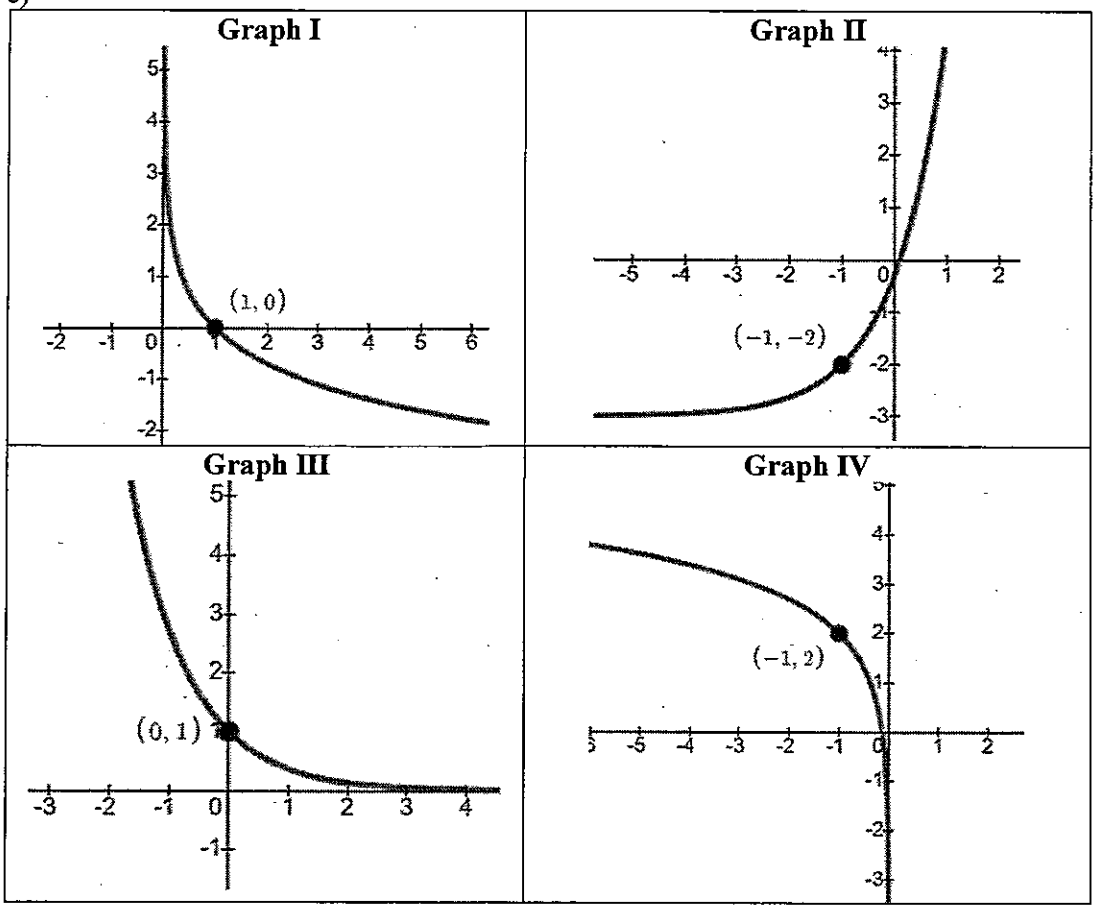
Continued...

ii) Find the inverse of $g(x)$. [1.5 marks]

b) Solve $\ln(5x+3)-\ln 2x=1$ and leave your answer in a single quotient. [2.5 marks]

Continued...

c)



Match each of the following exponential/ logarithmic function with one of the graphs above labeled from I to VI. [4 marks]

No.	Function	Corresponding Graph (Write the answer as Graph I, II, III or IV)
i	$f(x)=e^{-x}$	
ii	$f(x)=e^{x+1}-3$	
iii	$f(x)=-\ln x$	
iv	$f(x)=\ln(-x)+2$	

Continued...

Question 5

a) Given the polynomial function $f(x)=(x-3)(x+1)^2(x-2)^3$.

i) What is the degree of $f(x)$? [1 mark]

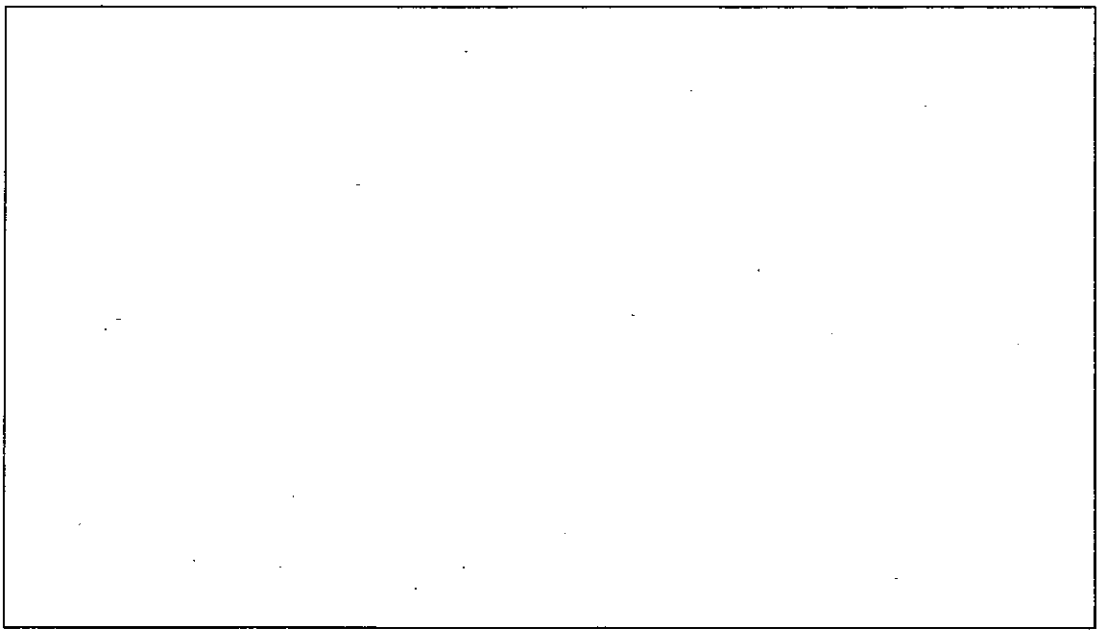
ii) Determine the zeros of $f(x)$ and their multiplicities. Also, determine whether the graph of $f(x)$ crosses or touches the x-axis at each zero. [1.5 marks]

iii) Find the y-intercept of f. [1 mark]

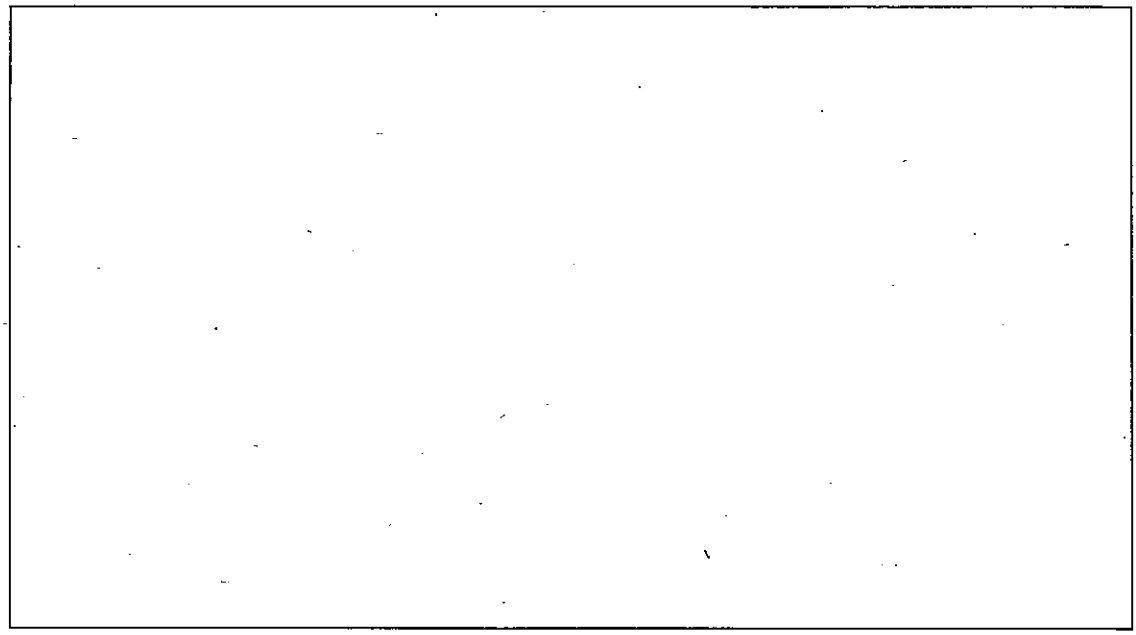
iv)Determine the end behavior of f. [1 mark]

Continued...

v) Sketch the graph of the polynomial function. Make sure your graph shows all intercepts and exhibits proper end behavior. [2.5 marks]



b) Use long division to find the quotient and remainder when the polynomial $f(x)=2x^4-x^3+x^2-3x+3$ is divided by $x+1$. You are required to state clearly the quotient and the remainder. [3 marks]



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